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EXAMINER

YEVSIKOV, VICTOR V

ART UNIT PAPER NUMBER

2891

DATE MAILED: 06/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/965,240

Applicant(s)

THAKUR ET AL.

Examiner

Victor V. Yevsikov

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 March 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9, 11-16, 18-20, 38-45 and 47-50 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-16, 18-20, 38-45 and 47-50 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 September 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 3/12/7/9/2/10/15/2 ; 1/21/3 ; 8/11/3 ; 3/15/5
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 11-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 11, the applicant refers to terms "smooth", "close proximity" and "near". These terms are confusing and not clear. In reviewing the drawings and the specification, the above passages are not distinctly disclosed in such a manner to reasonably understand the metes and bounds of applicant's claims. Relative terminology such as this creates a problem with ambiguity.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 – 9, 16, 18 – 20, 38-41 and 47-50 are rejected under 35 U.S.C. 102(e) as being anticipated by Batra et al. (US 6,060,355).

With respect to claims 1-5 Batra teaches a structure, comprising:

1. a polycrystalline layer 60 including Silicon-Germanium alloy and a rough layer formed from an undoped silicon, the rough layer 86 being formed on the polycrystalline layer 50 and including protrusions extending from a surface of the layer (fig. 6; col.4, lines 5-21).
2. the protrusions include hemispherical protrusions (col. 5, line 30).
- 3-4. the polycrystalline layer 60 comprises a conductive alloy that becomes polycrystalline at a temperature greater than 500 degrees Celsius (cols.4 – 5).
5. the polycrystalline layer comprises a bottom electrode of a capacitor and wherein the protrusions of the rough layer increase the surface area of the bottom electrode so as to increase the capacitance of the capacitor (col.1).

With respect to claims 6-9 Batra teaches a structure, comprising:

6. a top electrode 92;  
a dielectric 90 coupled to the top electrode; and  
a bottom electrode coupled to the dielectric, wherein the bottom electrode includes a rough layer and an electrode layer, wherein the rough layer includes hemispherical protrusions formed from undoped silicon, and wherein the electrode layer is formed from a polycrystalline alloy selected from a combination of silicon and germanium (col. 4-5).

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7. the electrode layer of the bottom electrode forms an outer surface of the capacitor, and wherein the rough layer form an inner surface of the capacitor (fig. 6).

8. the bottom electrode comprises an outer surface, an embedded structure, wherein the rough layer defines the inner surface and the outer surface, and wherein the relatively smooth surface defines the embedded layer (col.1, lines 43-62).

9. The undoped silicon includes undoped amorphous silicon (col.4, lines 21-23)

With respect to claims 16, 18-20 Batra teaches a method for forming a structure, comprising:

16. forming a polycrystalline layer including a silicon-germanium alloy; and forming hemispherical protrusions in an undoped silicon layer that overlies the polycrystalline layer (fig. 6; col.4-5).

18. forming hemispherical protrusions includes depositing the undoped silicon layer by using low-pressure chemical vapor deposition of silane gas at a temperature less than 550° Celsius and greater than 450° Celsius co.4, lines 62-67).

19. forming hemispherical protrusions includes forming atomic seeds from which hemispherical protrusions are grown by chemical vapor deposition of silane gas at a temperature less than 600° Celsius and greater than 550° Celsius (col. 4).

20. forming hemispherical protrusions include annealing so as to grow the atomic seeds to form hemispherical protrusions (col.5).

With respect to claims 38-41 Batra teaches a method for forming a structure, comprising:

38-41. a first layer formed from an undoped substance and including first and

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second surfaces, the first surface including a plurality of surface protrusions that increase a surface area of the first layer; and a second layer formed from a silicon-germanium alloy and formed abutting the second surface of the first layer and including a plurality of atoms, the atoms in the second layer being sufficiently bound in the second layer to substantially remain in the second layer during formation of the first layer and wherein

- the first layer comprises an undoped silicon layer;

- the undoped silicon layer comprises an undoped amorphous silicon layer;

- the second layer comprises a polycrystalline layer (cols. 4-5, lines 6-56).

With respect to claims 47-50 Batra teaches a method for forming a structure, comprising:

- a first electrode layer having first and second surfaces formed from undoped silicon, the first electrode layer having a U-shaped structure and the first surface corresponds to an inner surface and the second surface corresponds to an outer surface;

- a rough layer formed on the first surface of the first electrode layer, the rough layer including a plurality of surface protrusions that increase a corresponding surface area of the layer;

- a dielectric layer 90 formed on the rough layer and on the second surface of the first electrode layer, and

- a second electrode layer 92 formed on the dielectric layer, and wherein the first electrode layer comprises a polycrystalline layer.

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the first and second rough layers comprise first and second HSG layers, respectively.

the dielectric layer comprises a first segment formed on a first portion of the second surface of the first electrode layer and a second segment formed on a second portion of the second surface of the first electrode layer.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 42-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Batra and in view of Dennison et al. US 5,340,765.

Batra teaches all the limitations of the claims except wherein

the first and second rough layers formed on the first and second surfaces of the first electrode layer, respectively, each of the first and second rough layers including a plurality of surface protrusions that increase a corresponding surface area of the layer;

a dielectric layer formed on the first and second HSG layers; and

a second electrode layer formed on the dielectric layer.

However, Dennison teaches forming the first and second rough layers (31,51) formed on the first and second surfaces of the first electrode layer, respectively, each of

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the first and second rough layers including a plurality of surface protrusions that increase a corresponding surface area of the layer;

a dielectric layer 81 formed on the first and second HSG layers; and

a second electrode layer 82 formed on the dielectric layer (figs. 7a – 8; col. 4, lines 28-51).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to use multilayer of HSG of Dennison in the capacitor of Batra, in combination, since HSG is conventionally used in capacitor formation to increase the surface area of the capacitor and thus increase its capacitance.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor Yevsikov whose telephone number is (571) 272-1910. The examiner can normally be reached on Monday –Thursdays 8:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, examiner's supervisor, William B. Baumeister, can be reached on (571) 272-1722. The fax phone numbers for the organization where this application or processing is assigned is (703) 873-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR. Status information for unpublished application is available through Private PAIR only. For more information



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about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*V. Yevsikov*

Victor Yevsikov  
Examiner

May 13, 2005

*B. William Baumeister*

**B. WILLIAM BAUMEISTER  
SUPERVISORY PATENT EXAMINER**